

**REMARKS**

Claims 1 and 2 are pending in the application. Claims 1 and 2 are herein amended. It is respectfully submitted that this Amendment is fully responsive to the Office Action dated March 26, 2010.

**Examiner Interview**

Applicants appreciate the courtesies extended by Examiner Johnson during the interview conducted on June 24, 2010 regarding the substantive rejection of claim 1. The contents of the interview are incorporated into the remarks below.

**Amendment to Specification**

Applicants herein amend the last sentence in paragraph [0029a] of the specification (e.g., to correct a typographical error) to recite:

“The drawing also shows that when the total crowning amount is 50 µm or more, the torque ratio stably scatters in a lower-value range in comparison with the case where the total crowning amount is 50 µm ~~or more~~ less.”

**Claim Objections**

Claim 1 stands objected to because of an alleged informality.

To expedite prosecution, Applicants herein amend line 8 to recite “the roller,” as suggested by the Examiner.

**Claim Rejections - 35 U.S.C. §103**

Claims 1 and 2 stand rejected under 35 U.S.C. §103(a) as unpatentable over U.S. Patent No. 6,086,261 to *Nakagawa et al.*

Applicants disagree with the Examiner's obviousness rejection for at least the reasons discussed below.

First, *Nakagawa* teaches away from (1) having a roller crowning ratio which is less than 20% and (2) a crowning ratio of an outer ring 1 that is 40% or more. For example, the roller crowning ratio is 23.1% (i.e.,  $12/52 = .231$ ) and the outer ring crowning ratio is 38.5% (i.e.,  $20/52 = .385$ ). See col. 13, lines 9-13. As such, *Nakagawa* teaches away from aspects (1) and (2) of the claimed invention.

Second, the Examiner has not established that (1) the total crowning amount, defined as the sum of crowning amount of outer ring, the crowning amount of inner ring and two times the crowning amount of the roller, is more than 50  $\mu\text{m}$ , (2) the crowning ratio of the outer ring, defined as crowning amount of outer ring divided by the total crowning amount, is 40% or more, and (3) the roller crowning ratio, defined as two times the roller crowning amount divided by the total crowning amount, is 20% or less, are result-effective variables.

Only result-effective variables can be optimized. See MPEP §2144.05 II.B. A particular parameter must first be recognized as a result-effective variable, i.e., a variable which achieves a recognized result, before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation. *In re Antonie*, 559 F.2d 618, 195 USPQ 6 (CCPA 1977) (The claimed wastewater treatment device had a tank volume to

contractor area of 0.12 gal./sq. ft. The prior art did not recognize that treatment capacity is a function of the tank volume to contractor ratio, and therefore the parameter optimized was not recognized in the art to be a result- effective variable.).

In this application, for example, the inventors conducted verification test(s) (results in Figs. 6-9) to clarify the relationship between the rotational torque of the tapered roller bearing, the total crowning amount, and each crowning ratio. Many different tapered roller bearings were prepared, in which the total crowning amount and each crowning ratio were set to various values, to experimentally measure the resultant rotation torque. **The test confirmed that the rotation torque of the tapered roller bearing decreases** provided that the total crowning amount is 50  $\mu\text{m}$  or more, the outer ring crowning ratio is 40% or more, and the roller crowning ratio is 20% or less.

Whereas, *Nakagawa* makes no mention of satisfying these claim ranges in order to reduce rotational torque of the tapered roller bearing. *Nakagawa*'s roller crowning ratio is greater than 20%. As shown in the scatter graph illustrated in Fig. 8, when the roller crowning ratio is 20% or less (claimed range), the torque ratio stably scatters in a lower-value range in comparison with the case where the roller crowning ratio is more than 20% (*Nakagawa*'s ratio is 23.1%). See paragraph [0031]. Plus, *Nakagawa*'s outer ring crowning ratio is less than 40%. As shown in the scatter graph illustrated in Fig. 9, when the outer ring crowning ratio is 40% or more, the torque ratio stably scatters in a lower-value range compared with the case in which the outer ring crowning ratio is less than 40% (*Nakagawa*'s ratio is 38.5%). See paragraph [0030].

*Nakagawa's* bearing structure “ensures smooth axial movement of the tapered roller 3 toward the cone back face rib face 2c during the running-in operation and shortens the running-in operation time.” Col. 13, lines 13-17. Therefore, the parameters that are allegedly being optimized are not recognized as result-effective variables.

While *Nakagawa* recognizes that the amount of crowning can be optionally set (within ranges outside the claimed values), the Examiner has not pointed to any teaching in the cited reference, or provided any explanation based on scientific reasoning, that would support the conclusion that one skilled in the art would have considered it obvious to “optimize” the prior art structure by increasing the crowning ratio of the outer ring to 40% or more and decreasing the roller crowning ratio to 20% or less.

Accordingly, Applicants submit that the Examiner has failed to establish a *prima facie* case of obviousness.

### **Conclusion**

In view of the aforementioned amendments and accompanying remarks, Applicants submit that the claims, as herein amended, are in condition for allowance. Applicants request such action at an early date.

If the Examiner believes that this application is not now in condition for allowance, the Examiner is requested to contact Applicants' undersigned attorney to arrange for an interview to expedite the disposition of this case.

Application No. 10/589,620  
Art Unit: 3656

Amendment under 37 C.F.R. §1.111  
Attorney Docket No. 062901

If this paper is not timely filed, Applicants respectfully petition for an appropriate extension of time. The fees for such an extension or any other fees that may be due with respect to this paper may be charged to Deposit Account No. 50-2866.

Respectfully submitted,

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